GOLLIS UNIVERSITY
FACULTY OF AGRICULTURAL AND NATURAL RESOURCE MANAGEMENT

OPPORTUNITIES AND CHALLENGES OF SUNFLOWER PRODUCTION IN GOGOL-WANAAG VILLAGE

A THESIS SUBMITTED FOR THE PARTIAL FULFILMENT OF THE DEGREE OF BACHELOR OF SCIENCE IN AGRICULTURE

HOODO AND HAMSE ABDI ABDULAHI
SUPERVISOR: MUSTAFE ABDULAKADIR ABUDRAHMAN (M.Sc.)

Hargeisa, Somaliland
21-05-2017
GOLLIS UNIVERSITY
FACULTY OF AGRICULTURE AND NATURAL RESOURCE MANAGEMENT

Opportunities and Challenges of Sunflower Production in Gogol-wanaag Village

By: Hoodo and Hamse Abdi Abdulahi

Approved by:
Dean Faculty of Agriculture and NRM
Mr. Ahmed Ibrahim Aden

Supervisor:
Mr. Mustafe Abdulkadir Abdurahman

Signature:
Acknowledgements
Dedication
Abstract
# Table of contents

Approval letter..................................................................................................................

Acknowledgements...........................................................................................................

Dedication ...........................................................................................................................

Abstract ..............................................................................................................................

Table of Contents..............................................................................................................

List of Figures...................................................................................................................

List of Tables.......................................................................................................................

## Chapter 1: Introduction

1.1. Background ...................................................................................................................

1.2. Statement of the problem ............................................................................................

1.3. Research objectives ....................................................................................................

1.4. Research questions ....................................................................................................

1.5. Research hypothesis ..................................................................................................

1.6. Scope of the study ........................................................................................................

1.7. Significance of the study ............................................................................................

1.8. Limitation of the study ...............................................................................................  

## Chapter 2: Literature Review

2.1. Introduction to literature review ...................................................................................

2.2. Sunflower definition ....................................................................................................

2.3. Varieties of sunflower ...............................................................................................  

2.4. Sunflower production and yield improvement ............................................................

2.5. Common pest and diseases that attack sunflower ....................................................

2.6. Common weeds of sunflower .....................................................................................

2.7. Economic loss caused by common diseases and pests of sunflower .....................

2.8. Suitable practices and cultivation of sunflower .........................................................

2.9. Sunflower harvesting techniques and storage ............................................................
Chapter 3: Research Methods of the Study

3.1. Introduction to Research Methods
3.2. Study area
3.3. Study design
3.4. Sampling methods and techniques
3.5. Data collection tools

Chapter 4: Research Findings

4.1. General Information
4.2. Cultural practices of sunflower
4.3. Challenges of sunflower
4.4. Opportunity of sunflower production

Chapter 5: Conclusion and Recommendations

5.1. Conclusion
5.2. Recommendations

Reference

Questionnaire
List of Figures
CHAPTER ONE

1.0 Introduction

The aim of thesis is to study the challenges and opportunities of sunflower production in Gogol-wanaag village.

In Somaliland, the oil extracted from sunflower is used for cooking food. Other uses of sunflower include, its residue is used for feeding livestock and sometimes as organic matter for soil farms.

1.1 Background

The sunflower (Helianthus annuus L.) (Compositae now Asteraceae) is one of the species of the genus of 67 Helianthus species and it is an herbaceous plant that originated in North America and was domesticated around 1000 B.C. Sunflowers are such a special plant, in that every part of the plant can be used. The seeds, flowers, leaf, stem, and root all have several uses. Now, it has the annual yield of about 30 million metric tons of seeds, and consequently contributes 13% of the world’s total edible oil. source(U. S. Sunflower Crop Quality Report, 2011).

Sunflowers are usually tall annual or perennial plants that grow to a height of 300 centimetres (120 in) or more. They bear one or more wide, terminal capitula (flower heads), with bright yellow ray florets at the outside and yellow or maroon (also known as a brown/red) disc florets inside. Several ornamental cultivars of Helianthus annuus have red-colored ray florets; all of them stem from a single original mutant.[9] During growth, sunflowers tilt during the day to face the sun but stop once they begin blooming. This tracking of the sun in young sunflower heads is called heliotropism. By the time they are mature, sunflowers generally face east.[10] The rough and hairy stem is branched in the upper part in wild plants but is usually un branched in domesticated cultivars. The petiolate leaves are dentate and often sticky. The lower leaves are opposite, ovate or often heart-shaped.
1.2 Problem statement

The main research question of this study was: How do the current challenges and opportunities of sunflower production are aware of by farmers in Gogol-wanaag village.

1.3 Research objectives

a) To identify the socio-economic characteristics of farmers that grown sunflower in Gogol-wanaag village.
b) To explore the challenges and opportunities of sunflower production in Gogol-wanaag village.
c) To assess current situation of sunflower production in Gogol-wanaag village.
d) 2. To identify sunflower production in gogol_waang fillage

e) 3. To assess economical income of sunflower production of gogol_waang village

1.4 Research question

a) Level of knowledge of farmers towards the production of sunflower?
b) What are they Do farmers understood about the challenges and opportunities of sunflower production?
c) What are the existing extraction methods that farmers use to produce the oil from the sunflower plant?
d) Where do farmers obtain required information and technical with respect to sunflower production?

1.5 Research hypothesis

a) The sunflower growers are middle-aged farmers based on their socio-economic characteristics.
b) The level of knowledge of sunflower growers toward sunflower production is low.
c) Oil extracted from sunflower has some odor and this caused that many farmers to stop producing sunflower and selected to produce sesame.


d) Sunflower growers did not utilize the land resource that is available for the production of large quantity of sunflower crop.

1.6 Scope of the study

This study focused on the challenges and opportunities of sunflower production in Gogol-wanaag village. This study also assesses opportunities that is available to sunflower farmers and challenges that hinders their productivity. However, due to budge and time constraints, the study was focused on 15 farmers that grow sunflower in Gogol-wanaag village.

1.7 Significant of the study

The outcome of this study may contribute important information about the farmer’s perception of sunflower production and the potential implication of oil extracted from this plant.

The importance of this study is to get reliable research challenges and opportunity of sunflower in Somaliland specially gogol_wanaag area.

1.8 Limitation of the Study

The most serious limitation of the study was lack of sufficient literature on opportunities and challenges of sunflower production. The other limitations include lack of time, and availability of the respondents (farmers

1: The study has some shortcomings resulting most specially from the scope of sunflower

2: lack of technical knowledge about sunflower in gogol_wanag farmers

3: This include environmental indicators such as soil type, size, daily sunlight, humidity and radiation rate all of which greatly affects sunflower. Production

4: Secondly the fertilizer used in this study does not be a symbol of the total amount since most farmers buy fertilizer from market which is usually c

5: It was difficult to collect data on fertilizer used from now the study could only rely on the companies import.
6. Finally, my research is basically based on natural hypothesis of the weakening analysis method. That yield is fixed through the period, so yield changes from period to period and the error of yield variation will overstress the effect climate variable on maize production.

7. Sunflower is really rare in Somaliland and the people are not understanding, sunflower oil or benefits of sunflower.

8. Poor infrastructure of gogol waang, roads of gogol waang are very difficult to travel

9. Main of barriers in this research is drought effect

10. Lack of finance to travel back to the gogol-wanaaag village to collect firsthand information has resulted in the dependence of secondary data as a source of information, which make the research become quantitative and qualitative research.
Chapter Two

Literature Review

2.1. Introduction

✓ FAO (2012) Add that factors affecting sunflower productivity include poor agronomic practices, affordability of improved seed varieties, lack of access to inputs including fertilizer, manure, disease and pest control chemicals, and adequate machinery, limited or no access to extension services, an unreliable market and low prices for seed.

✓ Among others (Business Care Services Limited and Center for Sustainable Development Initiatives, 2012). As such, sunflower is an untapped sector with significant potential and its relatively poor productivity is a strong argument for the government to find a range of measures to boost this sector and to support rural development in general.

✓ The sunflower sector has faced a number of challenges which to some extent have affected sunflower growers. it has been noted that sunflower growers lack capacity in forming farmers groups; hence farmers groups which were formed are still weak. (Rural Livelihood Development Company, 2012).

✓ Sunflower seed cultivation is the most economical alternative cash crop for smallholder farmers as its profitability margins generally exceed those of other commonly found cash crops (FAOSTAT, 2009)

2.2. Sunflower definition

Definition of sunflower

1): a tall plant that has very large yellow flowers and that produces seeds which can be eaten

2): a tall plant often grown for its large flower heads with brown center and yellow petals or for its edible oily seeds
2.3. Varieties of sunflower

Everyone is familiar with the huge sunflowers that grow on towering eight-foot-tall stalks. But, did you know that some varieties top off at a modest 15 inches?

The towering ‘Mammoth’ variety is the traditional giant sunflower. It is excellent for snacks and bird feeds, too.

‘Autumn Beauty’: One of the most spectacular cultivars has many 6-inch flowers in shades of yellow, bronze, and mahogany on branching stems up to 7 feet tall.

‘Sunbeam’: A standout bouquet flower, the van Gogh sunflower grows on a 5-foot plant with 5-inch flowers. The big, no-mess, pollen less flowers has rich, golden-yellow rays.

‘Teddy Bear’: Just 2 to 3 feet tall, this small flower is perfect for small gardens and containers. The fluffy, deep-gold, 5-inch blossoms last for days in a vase.

Giantess' produces heads a foot or more across (county fair alert!) on plants growing to 12 feet or more in height. It doesn't need to be staked and produces pounds of seeds (for you and the birds).

Lemon Queen' is the sunflower chosen by the Great Sunflower Project for its annual bee count. Bees love this sunflower, which can be grown in containers. It tops out at about 72 inches tall in the ground. Find out more about the project at greatsunflower.org.

Mammoth Grey Stripe' is huge growing to 12 feet tall—and it produces seed that both you and the birds will love on blooms.

2.4. Sunflower production and yield improvement

Dr. Billy E. Warrick, Extension Agronomist (Retired) Description/Agronomic Characteristics:

Sunflowers are grown in Texas for four principal marketing objectives. Confectionary sunflower in the large seeded white stripe sunflower which is grown for human consumption and bird feed. The hybrid oil type sunflower is utilized as a source of high quality vegetable oil with the
extracted meal utilized as a protein source in livestock feed. Hybrid oil types are also used in bird feed mixtures. Another popular use for sunflower plantings is a food plot for wild birds, mostly white winged and mourning doves. Properly managed sunflowers might yield 1000 to 1400 pounds per acre dry land, and perhaps 50% more under irrigation.

2.4.1. **Specific Areas of Adaptation:**

Sunflowers are adapted to a wide variety of soils and climatic conditions but perform best when grown on good land and provided sound management practices. Some soils consistently produce larger yields of sunflowers than other soils. The properties of soils that influence sunflower yields include (a) water holding capacity, (b) internal drainage, (c) seedbed condition, and (d) soil fertility.

Under dry land farming, medium and moderately fine textured soils that have moderate to good internal drainage are better suited for sunflowers than is the course or the many fine textured soils. Soils such as the loams; silt loams, clay loams, and salty clay loams usually have moderate to large water holding capacities and are not as doughy as the sands; sandy loams, and loamy sands. The coarse textured soils, because of their lower water holding capacity, generally do not provide enough water for high yields, although good yields may be obtained when seasonal precipitation is adequate and the rains are uniformly distributed throughout the growing season. The fine textured soils, on the other hand, have higher water holding capacities, but the internal drainage of some of these soils is often restricted. Under wet conditions, these soils have water-logged or saturated conditions causing an oxygen deficiency which slows growth and promotes fungal seedling diseases. Wet, low lying fields also are slow to warm up in the spring, and usually cause seeding delays.

2.4.2. **Length of growing season:**

Most sunflower varieties mature in 85 to 95 days. As maturity progresses with heat units, it takes early planted sunflowers longer to mature than later planted acreage of the same variety. Maturity of the crop is also hastened by photoperiod in late plantings.

Varieties Suited for Use:
Sunflowers are presently grown from North Dakota and Minnesota south to Texas. In addition, sunflowers are grown in Indiana, Ohio, Michigan, Pennsylvania, and Georgia

Most oil and confectionary cultivars presently available are the result of hybridization. Seed of these hybrids is more expensive than open pollinated sunflowers but the associated hybrid vigor generally results in higher yields. In sunflower planted for food plots, it is not necessary to seek hybrid seed. Experimental trials have not been recently conducted in West Central Texas to evaluate the best germ plasma. Seek information from sunflower seed producers relative to hybrid selection.

Sunflowers are of either standard height or double dwarf. The dwarf sunflower seldom achieves more that 40 inches in height while standard height hybrids can exceed 6 feet if growing conditions are good. The primary advantage of dwarf hybrids is lodging resistance. Dwarf hybrids are often planted in narrow rows at higher populations, whereas standard height hybrids are best planted in conventional rows.

2.4.3. Production Requirements:

Planting Dates

Soil temperatures should be 50 degrees Fahrenheit or above when the seed is planted. This will probably occur in mid- March or early April. The seedling sunflower plant will tolerate lower temperatures but plant growth is very slow. Planting after July 1 may result in lower grain yields if climatic conditions are not ideal. Row direction has little effect on grain yield, however, prevailing winds may tend to lodge plants if rows are planted across the wind. The sunflower is Phototropic (head faces east in morning and west in evening) in its vegetative growth while most heads face east after the flowers are open.

Seed will germinate at 42 degrees Fahrenheit but a 50 degree temperature is more satisfactory for uniform stands. Temperatures must be 26 degrees Fahrenheit or lower for several hours to kill mature plants. Climatic conditions during seed development affect fatty acid composition of the oil which determines its food value. Tolerance to cold and high temperatures contributes to sunflower adaptation in different environments.
The seedbed should be prepared so that it is moist and firm with the surface rough enough to minimize soil drifting. A firm seedbed is desirable so that seeds planted at shallow depths in cool soils obtain adequate moisture for rapid and even emergence. Soil compaction by excessive land preparation should be avoided because this promotes poor drainage and increases the probability of downy mildew in areas where this disease is prevalent.

Sunflowers are able to emerge from rather deep placement. The important consideration in planting is to place the seed into moisture, but in no case should the depth of seeding be more than three inches. Uniform stands should be a goal for most efficient use of water, nutrients and light.

**Row Width and Plant Population**

Sunflowers are a row crop, but the row width varies depending upon the equipment available. Performance has been better when the width of the row has been between 20 and 30 inches, however, widths as wide as 40 inches and as narrow as 14 inches have produced good yields. Row spacing with conventional height sunflower should correspond with harvest equipment. A difference of a few inches in row width would not justify the investment for a different set of equipment.

Plant population per acre should remain the same regardless of row width. For example, the number of plants per acre should be the same in fields with 36-inch rows as in fields with 18-inch rows. The seed spacing must be proportionately increased with lower germinating seed and decreased with higher germinating seed.

Sunflowers compensate for differences in plant populations by producing large seeds and large heads at low populations. Oilseed varieties may be planted at a higher population than non-oil varieties. Seed size is unimportant in oilseed types but very important in non-oil varieties for human food markets. Plant populations for oilseed varieties should be between 15,000 and 22,000 plants per acre with adjustments made for soil type and for the production potential of the soil. Lower populations are used on the lighter soils, those with lower water holding capacity, and where rain patterns are inadequate. Confectionary varieties grown for the food contracts (non-oil) should be planted at a population between 12,000 and 18,000 plants per acre. Many of the confectionary contracts are based upon seed size. A large seed size is required, and a drastic
price reduction may result with the delivery of small seed. Low plant population helps insure consistently large seed. Under dry land production, oil seed types do not have the same seed size requirements, and may pose less pricing risk. By planting dwarf sunflowers at the 25,000 to 30,000 seeding rate, lodging is greatly reduced, and the small plant uses less water.

**Cultural Practices**

Proper adjustment and operation of planting equipment is one of the most important operations in sunflower production. Yield potential of the field can be influenced greatly by the population distribution as well as the number of plants. Plate less and air-planters have been used effectively to get good seed distribution. However, conventional planters will provide good seed distribution by using correct planter plates, properly sized seed, and proper seed kickers. Several commercial seed companies supply properly sized plates for the seed they sell. The only other modification required for standard planters is sunflower seed kickers. Grain drills are used on some farms where row crop equipment is not available. The results are not particularly good because of seed damage and poor seed distribution, especially for large seeds.

Any conventional corn planter or precision drill can be used for planting. Use plastic plates with filler rings matching the seed size indicated on the bag for plate planters. Some farmers have experienced difficulty when the small seed sizes were too small for the drum being used on air planters. Sunflowers should be planted in rows to permit cultivation.

Seed should be planted 1 to 2 inches deep depending on soil moisture conditions. A sunflower may take longer to emerge than grain crops because of slow moisture penetration through the aching or seed coat.

**Fertilizer Requirements**

Many growers believe that sunflowers do not require as much applied fertilizer as cereals. Sunflowers have an extensive root system which may help them utilize residual soil nutrients. To achieve consistent yields, an adequate fertilizer program must be a part of sunflower production.

Fallowed soils frequently have adequate nitrogen for a sunflower crop, but not enough phosphorus and potassium.
Soil sampling and soil testing are recommended for determining the soil fertility level and for making fertilizer recommendations. Soil tests make it possible to classify the soil’s ability to supply nutrients as very low (VL), low (L), medium (M), high (H) or very high (VH). Fertilizer recommendations are based on the level of available nutrients and a realistic yield goal. A realistic yield goal is estimated from the highest sunflower yield that has been produced on the field or farm. It is then adjusted up or down depending on stored soil water, on expected precipitation, and on changes in management practices.

Because of the nature of phosphate and potash chemistry in the soil, these nutrients move very little with soil water. A 6 inch soil sample is usually adequate for these elements. The amounts of phosphate (P2O5) and potash (K2O) which should be added as fertilizer will be indicated in the recommendation section of your soil sample analysis.

To date, use of micronutrients has not been shown to give profitable responses. If for some reason a micronutrient problem is suspected, it is suggested that a soil test be obtained to evaluate crop needs.

Sunflower seeds are sensitive to fertilizer salts. The nitrogen (N) plus potash (K2O) or the phosphate (P2O5) should be limited to 5 pounds per acre when fertilizer is placed in contact with the seed. Where the fertilizer is banded 2 inches to the side and 2 inches below the seed, the entire recommended rate can be applied with the planter. Where soil tests indicate a need for a nutrient, it is advisable that some starter fertilizer be banded at planting to increase nutrient uptake.

Nitrogen can be broadcast either fall or spring on medium to moderately fine textured soils. To prevent loss of broadcast nitrogen, it should be incorporated within 2 days after broadcasting. For coarse textured and low lying fine textured soils, nitrogen may be broadcast in the spring and incorporated. A portion of the nitrogen also may be side dressed when the sunflowers are less than one-foot tall; side dressing at later stages may damage the lateral roots.

Where all the phosphate is broadcast, the recommended rate for very low, low and medium testing soil should be doubled. It is recommended, however, that at least 10 pounds of P2O5 be reserved for band application at planting. When the application is split between banding and broadcast, the portion not banded should be increased by 1.5 times. When potash is broadcast,
about 1.5 times more potash than recommended should be applied and incorporated.

**Water-Irrigation Needs:**

The sunflower plant is drought tolerant and has an extensive, heavily branched root system which permits it to extract more deep soil moisture than corn roots. For this reason, preplant irrigations can have a longer benefit to sunflower than other grain crops. Short periods of drought may not greatly reduce seed yield because crops are less stressed due to the large root volume. The critical yield period occurs 20 days before and after flowering. Make sure that adequate water is available to the crop at the time the sunflower bud reaches about 0.75 to 1 inch in diameter. If dry conditions persist, apply a second irrigation about 20 days following the first and in unusually dry weather, a third may be required in late grain fill.

**2.5. Common pest and diseases that attack sunflower**

**2.5.1. pests/diseases**

**Pests**

Birds and squirrels will show interest in the seeds. If you plan to use the seeds, deter critters with barrier devices. As seed heads mature and flowers droop, you can cover each one with white polypus garden fleece.

If you have deer, keep them at bay with a tall wire barrier.

Sunflowers are relatively insect-free. A small gray moth sometimes lays its eggs in the blossoms. Pick the worms from the plants.

Downy mildew, rust, and powdery mildew can also affect the plants. If fungal diseases are spotted early, spray with a general garden fungicide.

**Diseases**

Downy mildew, caused by the seed-borne, soil-borne and wind-borne fungus, Plasrnopara halstedii, occurs in all areas of intensive production and is the most serious disease in the relatively flat areas.
Plants may be infected from the time of seed germination until flower; however, they are more prone to total (systemic) infection during or immediately following emergence. Typical symptoms include dwarfing and discoloration of the leaves, appearance of white cottony masses on the lower leaf surfaces during periods of high humidity, and little if any seed set in erect platform heads. Plants infected early in their development normally do not produce seed. Plants infected later seldom show systemic symptoms. They may carry the fungus and produce infected seed which can, if used for seed purposes, carry the disease to other fields the following year. Plants infected after the 4-leaf stage may exhibit root damage and are more susceptible to drought and lodging.

Dwarfing, stunting and distortion of plants exposed to herbicide drift, especially 2, 4-D and related compounds, may cause symptoms which sometimes are mistaken for downy mildew.

Planting mildew-infected seeds seldom results in systemically infected seedlings. However, plants grown from infected seeds often harbor the disease in their tissue. This allows the fungus to become established in the soil. The next time sunflowers are grown on the field, systemically infected plants may occur. The fungus can persist in the soil for 5 to 10 years after introduction. Thus, control of the disease by short-term rotations is not possible.

Sunflowers planted on land with no previous sunflower history have occasionally shown considerable downy mildew, resulting in a great deal of puzzlement among growers concerning the source of the disease and causing many to suspect seed transmission. Spores of the fungus occurring on volunteer or wild annual sunflower plants in neighboring fields or on neighboring farms can blow to newly-planted fields and can cause heavy infection under favorable weather conditions. These wind-borne spores probably are responsible for downy mildew in fields with no sunflower history. Spores can blow several miles under favorable conditions and still remain infectious.

**Control**

The disease cycle of downy mildew prevents complete control strictly by management practices. Although crop rotation, early season destruction of volunteer sunflowers, field selection and delayed planting until soil temperature supports rapid germination can minimize losses from downy mildew, planting resistant varieties affords the best way to eliminate losses.
2.6. Common weeds of sunflower

2.6.1. Major weeds and their control

Early weed control is important. Use light tillage to destroy germinated and emerged weeds prior to planting. Consider applying a herbicide such as Treflan, Amiben, or Tolban. Sunflower seedlings are strongly rooted; consequently they can be harrowed during the 4 to 6 leaf stage. Post emergence harrowing should be done across the rows on a warm, sunny day to get best weed kill and little crop injury because the sunflower plants are less turgid. Cultivate, if needed, when plants are 8 to 12 inches tall. Cultivation should not be closer to the row than plant leaf spread. Deep cultivation when plants are 12 to 18 inches tall may drastically reduce yields.

2.7. Economic loss caused by common diseases and pests of sunflower

Field studies were conducted near College Station, TX, in 2006 and 2007 to evaluate the economic impact of common sunflower interference in field corn. A density of one common sunflower per 6 m of crop row caused a yield loss of 293 kg ha⁻¹. Estimated losses at a net corn price of $0.08 kg⁻¹ was $92 ha⁻¹ for infestation levels of four common sunflower plants per 6 m of row. Corn yield was increased by 32 kg ha⁻¹ by each 1,000 plant ha⁻¹ increase in corn planting density. Corn planting densities of 49,400 and 59,300 plants ha⁻¹ provided the greatest net returns with or without the presence of common sunflower competition. Corn yields were reduced by extended duration of sunflower competition, with losses exceeding 1,500 kg ha⁻¹ per week and increasing in magnitude at a decreasing rate throughout the growing season. Herbicide treatments provided net returns of $600 to $1,300 ha⁻¹ above no weed control in both 2006 and 2007. Net returns of $609 and $653 ha⁻¹ were obtained without the use of any herbicide for sunflower control. Determining the economic impact of common sunflower interference in field corn allows producers to estimate the overall net return on the basis of duration of common sunflower interference and density, while considering varying net corn prices, crop planting density, and herbicide application costs. En 2006 y 2007 se realizaron estudios de campo circa de College Station,
2.8. Suitable practices and cultivation of sunflower

Cultivation of sunflower selection of varieties are suitable and recommended varieties of sunflower for all seasons i.e kharif, rabbi, summer. You can get the seed of above mentioned varieties at sowing of seeds- seed rate 8-10 kg / ha.
Spacing 1.60_30 in heavy soil. 2. 45_22.5 in medium soil. Seed treatment with 3 gram thrum per kg of seed.
Sowing time kharif last week of June to first week of July. Rabi – second week of October
Summer- last week of January to first week of February
-Fertilizers- provide the crop with 75 kg urea, 200 kg of single super phosphate and 50 kg mutilate of potash per hectare area at the time of sowing as a basal dose. Remaining half dose of urea 75 kg should be applied 30 days after sowing

Thinning – carry out thinning operation 10-12 days after sowing to maintain single, healthy plant per hill.

Weed control- To control the weeds take pre-emergence spray of basal in 2 liters per hectare mixed in 700 lit. Of water.

Important points to be kept in mind- 1) do not take sunflower crop sequential crop. (Double crop.)
2) Do not use the seed of hybrid varieties in next season for sowing.
3) Carry out hand pollination at the time flowering to increase the seed setting and ultimately yield. This can be done at alternate day in morning hours (8-11am). If hand pollination is not possible then take spray of borax 20 gram mixed in 10 liters of water

Sunflower is propagated by seed.

Many different tillage systems can be used effectively for sunflower production.
Soil preparation should be focused on decreasing runoff, especially in
The case of soils with a low infiltration rate. These losses can be limited to a
Great extent by applying the correct soil cultivation practices. Conventional systems of seedbed preparation consist of mould board plowing or chisel plowing. The aim of the cultivation is to break up limiting layers, destroy weeds, and provide a suitable seedbed and to break the soil surface and at the same time to ensure maximum rainfall infiltration, as well as to prevent wind and water erosion. Both germination percentage and lodging have been shown to increase in
ridge-till systems vs. level plantings. Several tillage systems have been used with some success in specific environments.

**Major considerations are:**

- Firm placement of seed near moist soil
- Absence of green vegetation during emergence
- maintaining an option to cultivate
- reducing the risk of soil erosion

### 2.9. Sunflower harvesting techniques and storage

#### 2.9.1. harvest/storage

For indoor bouquets, cut the main stem just before its flower bud has a chance to open to encourage side blooms.

Cut stems early in the morning. Harvesting flowers during middle of the day may lead to flower wilting.

Handle sunflowers gently. The flowers should last at least a week in water at room temperature.

Arrange sunflowers in tall containers that provide good support for their heavy heads, and change the water every day to keep them fresh.

**Harvesting Sunflower Seeds**

To harvest seeds, keep an eye out for ripeness. The back of the flower head will turn from green to yellow and the bracts will begin to dry and turn brown; this happens about 30 to 45 days after bloom and seed moisture is about 35%. Generally, when the head turns brown on the back, seeds are usually ready for harvest. Cut the head off the plant (about 4 inches below the flower head) and remove the seeds with your fingers or a fork.

To protect the seeds from birds, you can cover the flowers with a light fabric such as cheesecloth and a rubber band. Or, you can cut the flower head early and hang the heads upside down until they seeds are dry; hang indoors or in a place that’s safe from birds and mice.

**Harvest equipment**
Any conventional grain combine can be used for harvesting with the addition of a sunflower head attachment. Long gathering pans extending ahead of the cutter bar are used to salvage shattered seed. Ten seeds per square foot equal a harvest loss of 100 pounds per acre. The price of these attachments varies depending upon the size of combine head and manufacturer. Harvesting may start when grain moisture reaches 18-20 percent. Some moisture testers will not check sunflower moisture; however, Dickey-John and Fermi offer a special chart and adapters for their machines.

Combine cylinder speed should be as slow as possible and still thresh seed from the head (300 to 400 RPM). Concaves are usually set wide open and fan air flow reduced approximately 50 percent. Some drying or air movement will probably be required during storage. Natural air with no added heat should be sufficient under most Ohio conditions. Grain should be 12 percent moisture for temporary storage and 9 percent for long time storage. Harvesting at a high moisture content (18 to 20%) normally results in higher yields, less bird damage, and less shattering or dropping of heads than when seeds are harvested at a lower moisture content.

### 2.9.2. Storage

Farm structures that are structurally adequate to store small grains are adequate for storing sunflower due to sunflower’s light test weight.

Seed should be cleaned for storage. Fines tend to concentrate in the center of the bin. This area tends to be wetter and is more prone to storage problems. Airflow will also be restricted by the fines, limiting cooling by aeration. Large pieces of head, stalk, and corolla tubes, which frequently adhere to the seed, should be removed because they are higher in moisture than the seed.

Oil sunflower should not be stored above 10 percent moisture during the winter and 8 percent during the summer. Nonoil seed sunflower should not be stored above 11 percent moisture during the winter and 10 percent during the summer. Sunflower can be stored for short periods at 12 percent with adequate airflow to keep the seeds cool. Resistance of oilseed sunflower to fungal infection during storage at 10 percent moisture is equal to wheat resistance at 17 percent stored moisture.
Aeration is essential, especially in the larger bins now available. Aeration may be accomplished with floor-mounted ducts or portable aerators. Sunflower should be rotated between bins when aeration is not available.

An air space should be left in the top of the bin to facilitate checking the condition of stored seed. Bins should be checked initially every two weeks for moisture condensation on the roof, crusting, and for changes in temperatures within the pile. Any of these conditions could indicate the presence of mold or insects. If the pile has started to heat, the pile should be cooled immediately because spontaneous combustion is a real danger. The sunflower should be checked at least monthly after the seeds have been cooled to about 25 Fahrenheit for winter storage and a history of temperature and moisture content has been developed

Sunflower can be stored more than one season under proper conditions (dry, clean, aerated, and in tight bins), but processors of non oilseed sunflower for human consumption prefer not to use seed that has been stored more than one season.
Chapter Three

Research Methods of the Study

3.1. Methods Introduction to Research

This chapter clearly defines the research methods used to conduct the study. The study area, sampling methods and techniques, variables of the study and data collection tools will be presented.

3.2. Study area

The study area is Gogol-wanaag village. It is located 113 km to the west of Hargeisa. It is a farmland village mostly growing fruit and vegetables. Sunflower is one of the crops they grow abundantly and that is why the researchers selected this area.

3.3. Study design

The study was designed as descriptive research due to the sunflower seeds processing combined with different views from different farmers and officers to the community. The study was consumed different resources including time.

Descriptive study was help to look for problem and how to solve for future.

3.4. Sampling methods and techniques

This study was employ one sampling technique, namely simple random sampling. Simple random sampling was used to select the respondents according to the population of Gogol-wanaag village. 500 families are living in Gogol-wanaag village. Most of population of Gogol-wanaag village is children due to this condition the researchers decided to use 3% of total population as a sample. $500 \times \frac{3}{100} = 15$
3.4. Variables of the study

Variable is a characteristic or feature that varies, or changes or effect sunflower production in gogol-wanag

Three sunflower plants with salt water. Each plant receives a different concentration of salt solutions. A fourth plant receives pure water. After a two-week period, the height is measured.

The indecent variable is sunflower plants, the dependent variable is height measured and the control variable is the fourth plant.

3.5. Data collection tools

In order to get insight of the study primary and secondary methods were used in data collection. Different methods of data collection were used to collect enough information concerning the study. Primary data collected through interview, questionnaires and observation and secondary data collected through documentation.
Chapter four
Findings and data analysis

4.1. General information

<table>
<thead>
<tr>
<th>age of hold house</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid 20-30</td>
<td>1</td>
<td>6.7</td>
<td>6.7</td>
<td>6.7</td>
</tr>
<tr>
<td>30_40</td>
<td>7</td>
<td>46.7</td>
<td>46.7</td>
<td>53.3</td>
</tr>
<tr>
<td>40_50</td>
<td>7</td>
<td>46.7</td>
<td>46.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Most of the respondents age are 20_30 become 47% while the 30_40 are 7% and 40_50 are 46%. Most of the respondents are 20_30 and 40_50 so the majority of the respondents are 20_30%.
### Marital Status

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>6</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
</tr>
<tr>
<td>Married</td>
<td>9</td>
<td>60.0</td>
<td>60.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

**Figur4.1**

This figure shows as the marital status of the respondent. The majority of the respondents Gogol_waang are married 60% so that shows you The responsibility of gogol_waang farmers This graph shows the single respondents those are 40%
Can you read and write

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>yes</td>
<td>11</td>
<td>73.3</td>
<td>73.3</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>4</td>
<td>26.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 4.2
The majority of the respondents can read and write
73% So this graph shows
The knowledge of gogol_waang farmers are highly readers and writers
### Number of years of education

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>1_6</td>
<td>5</td>
<td>33.3</td>
<td>33.3</td>
</tr>
<tr>
<td></td>
<td>7_8</td>
<td>7</td>
<td>46.7</td>
<td>80.0</td>
</tr>
<tr>
<td></td>
<td>9_12</td>
<td>3</td>
<td>20.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

### Education

Figure 4.3
This graph shows the education level of gogol_waang farmers. Most of the respondents are educated 33% primary while 46% are intermediate and 20% are secondary.
Figure 4.4
This graph shows respondent’s experience of gogol_waang village
Most of the respondents they are more experience in farming system
27% are experience, this mean how the gogol_waang village, farmers production
Are increase day by day.
4.2. Cultural practices of sunflower

How many hectares in your farm do you plant sunflower?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3 hectare</td>
<td>13</td>
<td>86.7</td>
<td>86.7</td>
<td>86.7</td>
</tr>
<tr>
<td>4 hectare</td>
<td>2</td>
<td>13.3</td>
<td>13.3</td>
<td>100.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.2
This figure shows the hectares those are the farmers of sunflower of gogol_waang. Plant really they are use small scale farming system in according to the sunflower production. Sunflower production is need large scale farming system, while the farmers of gogol –waang are use 1.3 that most of the respondents say 87%. so Majority of the respondents use the hectares of their farms are 1.3 hectar.
choice of prefer of sunflower

Figure 4.2.1
Most of the respondents prefer sunflower production
As oil production. so the majority respondents of gogol _waang people are prefer oil production 93%
Do you experience labor shortage in any period within this year?

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>yes</td>
<td>12</td>
<td>80.0</td>
<td>80.0</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>3</td>
<td>20.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 4.2.2
This figure shows the experience of labor shortage during the year.
Most of the respondents say yes, while few of them say no.
Most of the respondents say, January is month of labor shortage occur.
Figure 4.2.4
This graph shows employment of children

Majority of the respondents say, that they are not employ the Children 73%, few of them they are say, they are employee the children 26.7%
In we are in our research we can’t see, children those are work in farm.
Such as cultivation, weeding etc
Do you apply fertilizer

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>yes</td>
<td>2</td>
<td>13.3</td>
<td>13.3</td>
</tr>
<tr>
<td></td>
<td>no</td>
<td>13</td>
<td>86.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**Figure 4.2.5**

This figure shows if the respondents use the fertilizer in their sunflower production. Most of the respondents said that they are not use fertilizer. While few of them use fertilizer.
If yes which fertilize do you apply

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>organic</td>
<td>1</td>
<td>6.7</td>
<td>50.0</td>
</tr>
<tr>
<td></td>
<td>inorganic</td>
<td>1</td>
<td>6.7</td>
<td>50.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2</td>
<td>13.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Missing</td>
<td>System</td>
<td>13</td>
<td>86.7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

IfyesTitle

- 1
- 2

Figure 4.2.6

This figure shows, type of fertilizer that the respondents use, When they are use fertilizer they are use equal value of both, organic and In organic fertilizer.
4.3 Three challenges of sunflower

Which is common problem faced of sunflower production in Somaliland especially gogol-waang area

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Seed problem</td>
<td>2</td>
<td>13.3</td>
<td>13.3</td>
<td>13.3</td>
</tr>
<tr>
<td>poor marketing</td>
<td>13</td>
<td>86.7</td>
<td>86.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.3

This figure shows as common problem faced sunflower, production in gogol_waang. The majority of the respondents said, common problem of sunflower production is Lack or poor market because the consumers are not understand, the sunflower oil production, while some of respondents said seed problem, how to get seed of sunflower is difficult.
Which pest that attacks sunflower of gogol_waang

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Birds</td>
<td>11</td>
<td>73.3</td>
<td>73.3</td>
<td>73.3</td>
</tr>
<tr>
<td>human</td>
<td>4</td>
<td>26.7</td>
<td>26.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.3.1
In this table tell us the major pest that attack sunflower production
That the respondents tell us in our research
The majority of the respondents said 73% birds are effect sunflower, production in gogol_waang village.

Figure of sunflower of gogolwanaag

- 73% Valid birds
- 27% Valid human

Figure 4.3.1
In this table tell us the major pest that attack sunflower production
That the respondents tell us in our research
The majority of the respondents said 73% birds are effect sunflower, production in gogol_waang village.
Which disease commansunflower crop of gogol waang

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>girise</td>
<td>13</td>
<td>86.7</td>
<td>86.7</td>
</tr>
<tr>
<td></td>
<td>rust</td>
<td>2</td>
<td>13.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

common disease of sunflower

Figure 4.3.2
This figure shows as common disease of sunflower of gogol-waang village
The majority of the respondents said white fly or girise effect sunflower oil production.
In 87%, respondents said that sunflower effect their production, especially "karan time
What are marketing problems of sunflower production gogol-WAANG VILLAGE

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processing place</td>
<td>9</td>
<td>60.0</td>
<td>60.0</td>
<td>60.0</td>
</tr>
<tr>
<td>Poor understanding of consumer</td>
<td>6</td>
<td>40.0</td>
<td>40.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

**MARKET PROBLEM OF SUNFLOWER GOGOL WAANG VILLAGE**

![Diagram](image)

Figure 4.3.3

Most of the respondents say, the market problem of sunflower production processing place.
Because if sunflower of gogol_waang is good production yield they has no a place that they are processing, other respondents said poor understanding of consumers or or people that are sell.
The sunflower production.
WHERE DO YOU SELL YOUR SUNFLOWER PRODUCE

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid local market</td>
<td>6</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
</tr>
<tr>
<td>gogolwaaag</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arbsiyo market</td>
<td>6</td>
<td>40.0</td>
<td>40.0</td>
<td>80.0</td>
</tr>
<tr>
<td>Hargays market</td>
<td>3</td>
<td>20.0</td>
<td>20.0</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.3.4
The majority of the respondents said arabsiyo and gogal –wanaag are best market of sunflower oil production. While few of respondents said hargaysa is where they are sell their production.
**WHAT DO YOU USE THE RESIDE sunflowersqueezing the oil**

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid feeding livestock</td>
<td>13</td>
<td>86.7</td>
<td>86.7</td>
<td>86.7</td>
</tr>
<tr>
<td>As organic fertilizer</td>
<td>2</td>
<td>13.3</td>
<td>13.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 4.4**
The majority of the respondents of gogol-waang people they are use sunflower squeezing
Use .most of the respondents use as feeding live stock
Anthers are use as organic fertilizer.
4.4. Opportunity of sunflower production

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid oil family</td>
<td>5</td>
<td>33.3</td>
<td>33.3</td>
<td>33.3</td>
</tr>
<tr>
<td>nobenefits</td>
<td>10</td>
<td>66.7</td>
<td>66.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.4
The majority of the respondents of gogol-waang via allage said they are not get any benefits.
Because they are not produce or production is too low.
While antlers of respondents, we get family oil
The majority of the respondents said sesame oil is more consumption or prefer of sunflower. Because the community an till now lack of understanding the penifit or use of sunflower. Small or view of the respondents said we prefer sunflower oil than sesame oil.
Figure 4.4.2
The majority of the respondents of gogol_waang village are processing sunflower oil. In bullale farm, bullale farm has small processor, while ethers of respondents said they are processing in hargaysa.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td>bullale farm</td>
<td>11</td>
<td>73.3</td>
<td>73.3</td>
</tr>
<tr>
<td></td>
<td>hargaysa</td>
<td>4</td>
<td>26.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Most of the respondents said that or majority of the respondents of gogol_waang village said they are use sunflower as cooking.
**Figure 4.4.4**

The most of respondents of gogol_waang village said the season that they are planting is summer time, in summer planting is occur before summer and after summer.
which agricultural system do use for sunflower growing

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>rain-fed farming system</td>
<td>4</td>
<td>26.7</td>
<td>26.7</td>
<td>26.7</td>
</tr>
<tr>
<td>irrigated farming system</td>
<td>3</td>
<td>20.0</td>
<td>20.0</td>
<td>46.7</td>
</tr>
<tr>
<td>dryland farming system</td>
<td>8</td>
<td>53.3</td>
<td>53.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4.4.5
Most of the respondents of gogol_waang are dryland farming system
Gogol_waanag is only place in Somaliland that the crops or horticultural crop are grow
So the majority of the respondents said their farming system is dry land farming system.
which agricultural system do use for sunflower growing

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid rain-fed farming system</td>
<td>4</td>
<td>26.7</td>
<td>26.7</td>
<td>26.7</td>
</tr>
<tr>
<td>irrigated farming system</td>
<td>3</td>
<td>20.0</td>
<td>20.0</td>
<td>46.7</td>
</tr>
<tr>
<td>dryland farming system</td>
<td>8</td>
<td>53.3</td>
<td>53.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>15</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

![Pie chart showing the distribution of agricultural systems for sunflower growing]
Figure 4.4.5
Most of the respondents of gogol_waang are dryland farming system
Gogol_waang is only place in Somaliland that the crops or horticultural crop are grow
So the majority of the respondents said their farming system is dry land farming system.
Chapter Five

Conclusion and Recommendations

5.1. Conclusion

In collecting all this information is consisting of the fourth section we must have to conclude in this research and we recognize the problems of this thesis and also conclusion that can be derived from the gathered and collected data, we seek to resolve it as the proper ways. Most of the benefits of sunflower can be attributed sunflower oil production.

In this research were collected 15 target people all 15 respondents separate in both ages and gender. The objective of this research was to increase. The understanding use of sunflower oil production in Somaliland and increasing sunflower oil production, agriculture in golwaang village is one of the main sources of income for the farming communities and it is a cash crop for the local community, and it’s only villages that produce horticulture crops whitout irrigated .it’s dry land horticulture village that is good production ,irrigated farms.

As well-known in chapter four based in the research findings, the Research paper identifying more objectives as it was mentioned in chapter one

➢ To identify the socio-economic characteristics of farmers that grown sunflower in Gogol-wanaag village.
➢ To explore the challenges and opportunities of sunflower production in Gogol-wanaag village.
➢ To assess current situation of sunflower production in Gogol-wanaag village.
➢ To identify sunflower production in gogol_waang fillage
➢ To assess economical income of sunflower production of gogol_waang village
5.2. Recommendations

The researchers get important and very significant information on sunflower production in gogol waang Area. to increase production of sunflower and yield improvement, the researcher recommends that.

- To plant more sunflowers to produce enough quantity that can extract a lot of oil.
- To increase sunflower practices and husbandry during the field.
- To encourage and learn other farmers in the village to plant sunflower and utilize it.
- To transport their oil to the regional market (like Hargeisa) to gain more advantage than when they are buying it in the local markets.
- The government should subsidies farming equipment in order to lower the price. The study shows that many farmers have low income to afford purchase farming equipments.
- To plant more of sunflower or large scale farming system and forget small scale farming system
- Government should be a powerful incentive to encourage famer’s promotion of sunflower oil production of Gogol waang village, and giving training, workshops to change
- The experience people aware the people the benefit of oil production
- The ministry of agriculture must give training the farmers to increase the skills of farmers
- The government should create small industries that are processing in sunflower oil production
- Government of somaliland must promote and encourage sunflower oil production in a larger way by creating adequate infrastructure and facilities
1. *Helianthus agrestis* Pollard – southeastern sunflower – Florida Georgia
2. *Helianthus ambiguus* Britt. – Wisconsin Michigan Ohio New York State
3. *Helianthus angustifolius* L. – swamp sunflower – Texas Florida north to southern Illinois Long Island
4. *Helianthus annuus* L. – common sunflower, girasol – most of USA Canada
5. *Helianthus anomalus* S.F.Blake – western sunflower – Nevada Utah Arizona New Mexico
7. *Helianthus arizonensis* R.C.Jacks. – Arizona sunflower – Arizona New Mexico
8. *Helianthus atrorubens* L. – purpledisk sunflower – Louisiana Alabama Georgia Florida South Carolina North Carolina Tennessee Kentucky Virginia
9. *Helianthus bolanderi* A.Gray – serpentine sunflower – California Oregon
10. *Helianthus × brevifolius* E.Watson – Texas Indiana Ohio
11. *Helianthus californicus* DC. – California sunflower – California
12. *Helianthus carnosus* Small – lakeside sunflower – Florida
14. *Helianthus cinereus* Small – Missouri Kentucky Indiana Ohio
15. *Helianthus coloradensis* Cockerell – prairie sunflower – Colorado New Mexico
17. *Helianthus debilis* Nutt. – cucumberleaf Sunflower – Texas to Maine Mississippi
18. *Helianthus decapetalus* L. – thinleaf sunflower – eastern United States; Ontario Quebec
19. *Helianthus deserticola* Heiser – desert sunflower – Arizona Nevada Utah
20. *Helianthus diffusus* Sims – Missouri†
21. *Helianthus dissectifolius* R.C.Jacks. – Mexico
22. *Helianthus divaricatus* L. – woodland sunflower or rough woodland sunflower – eastern United States; Ontario Quebec
24. *Helianthus × doronicoides* Lam. – Texas Oklahoma Arkansas Missouri Iowa Minnesota Illinois Kentucky Indiana Ohio Pennsylvania Michigan New Jersey Virginia
25. *Helianthus eggertii* Small – Alabama Kentucky Tennessee
26. *Helianthus exilis* A.Gray – California
27. *Helianthus floridanus* A.Gray ex Chapm. – Florida sunflower – Louisiana Alabama Georgia Florida South Carolina North Carolina
28. *Helianthus giganteus* L. – giant sunflower – eastern United States; most of Canada
30. *Helianthus × glaucus* Small – scattered locales in southeastern United States
31. *Helianthus gracilentus* A.Gray – slender sunflower – California
32. *Helianthus grosseserratus* M.Martens – sawtooth sunflower – Great Plains Great Lakes Ontario Quebec

**Reference**
33. **Helianthus heterophyllus** Nutt. – variableleaf sunflower – Coastal Plain **Texas** to **North Carolina**

34. **Helianthus hirsutus** Raf. – hairy sunflower – central + Eastern United States, **Ontario**

35. **Helianthus × intermedium** R.W.Long – intermediate sunflower – scattered locales in United States

36. **Helianthus laciniatus** A.Gray – alkali sunflower – **Arizona** **New Mexico** **Texas** **Coahuila** **Nuevo León**

37. **Helianthus × laetiflorus** Pers. – cheerful sunflower, mountain sunflower – scattered in eastern + central USA + Canada

38. **Helianthus laevigatus** Torr. & A.Gray – smooth sunflower – **Georgia** **South Carolina** **North Carolina** **Virginia** **Maryland** **West Virginia**

39. **Helianthus lenticularis** Douglas ex Lindl. – California **Texas**

40. **Helianthus longifolius** Pursh – longleaf sunflower – **Alabama** **Georgia** **North Carolina**

41. **Helianthus × luxurians** (E.Watson) E.Watson – Great Lakes region

42. **Helianthus maximiliani** Schrad. – Maximillian sunflower – much of USA + Canada

43. **Helianthus membranifolius** Poir. – **French Guiana**

44. **Helianthus mollis** Lam. – downy sunflower, ashy sunflower – **Ontario**, eastern + central United States

45. **Helianthus multiflorus** L. – manyflower sunflower – **Ohio**

46. **Helianthus navarr** Phil. – **Chile**

47. **Helianthus neglectus** Heiser – neglected sunflower – **New Mexico** **Texas**

48. **Helianthus niveus** (Benth.) Brandegee – showy sunflower – **California** **Arizona**; **Baja California**, **Baja California Sur**

49. **Helianthus nuttallii** Torr. & A.Gray – western + central USA + Canada

50. **Helianthus occidentalis** Riddell – fewleaf sunflower, western sunflower – Great Lakes region, scattered in southeastern USA

51. **Helianthus × orgyaloides** Cockerell – **Colorado** **Kansas**

52. **Helianthus paradoxus** Heiser – paradox sunflower – **Utah** **New Mexico** **Texas**

53. **Helianthus pauciflorus** Nutt. – stiff sunflower – central USA + Canada

54. **Helianthus petiolaris** Nutt. – prairie sunflower, lesser sunflower – much of USA + Canada

55. **Helianthus porteri** (A.Gray) Pruski – Porter’s sunflower – **Alabama** **Georgia** **South Carolina** **North Carolina**

56. **Helianthus praecox** Engelm. & A.Gray Texas sunflower – **Texas**

57. **Helianthus praetermissus** – New Mexico sunflower – **New Mexico†**

58. **Helianthus pumilus** Nutt. – little sunflower – **Colorado** **Wyoming** **Montana** **Utah** **Idaho**

59. **Helianthus radula** (Pursh) Torr. & A.Gray – rayless sunflower – **Louisiana** **Mississippi** **Alabama** **Georgia** **South Carolina** **Florida**

60. **Helianthus resinosus** Small – resindot sunflower – **Mississippi** **Alabama** **Georgia** **South Carolina** **North Carolina**

61. **Helianthus salicifolius** A.Dietr. – willowleaf sunflower – **Texas** **Oklahoma** **Kansas** **Missouri** **Illinois** **Wisconsin** **Ohio** **Pennsylvania** **New York State**

62. **Helianthus sarmentosus** Rich. – **French Guiana**

63. **Helianthus scaberrimus** Elliott – **South Carolina**

64. **Helianthus schweinitzii** Torr. & A.Gray – Schweinitz’s sunflower – **South Carolina** **North Carolina**

65. **Helianthus silphioides** Nutt. – rosinweed sunflower – **Lower Mississippi Valley**
66. *Helianthus simulans* E.Watson – muck sunflower – southeastern USA
67. *Helianthus smithii* Heiser – Smith's sunflower – Alabama, Georgia, Tennessee
68. *Helianthus speciosus* Hook. – Michoacán
69. *Helianthus strumosus* L. – eastern + central USA + Canada
70. *Helianthus subcanescens* (A.Gray) E.Watson – Manitoba, north-central United States
71. *Helianthus subtuberosus* Bourg.
72. *Helianthus tuberosus* L. – Jerusalem artichoke, sunchoke, earth-apple, topinambur – much of USA + Canada
73. *Helianthus × verticillatus* Small – whorled sunflower – Alabama, Georgia, Tennessee